

### REMARKS

The specification has been amended to correct minor informalities.

Claims 1-11, 13, and 15-17 are pending in this application. Claims 12, 14, and 18-32 are canceled herein. Claims 1-5, 8, 10, 11, 13, and 15 have been amended herein. In view of these amendments and remarks, Applicant respectfully requests reconsideration of the claims.

Claims 1 and 3-5 were objected for various minor informalities. However, these claims have been amended as suggested by the Examiner or in other ways so that this objection is now moot.

Independent claims 1 and 10 and dependent claims 2, 12, 16, and 17 were rejected under 35 U.S.C. 102(b) as being anticipated by Mandelman, *et al.* However, independent claim 1 has been amended such that it now clearly defines over the Mandelman, *et al.* patent and all other references of record. More specifically, it is now clear that the bottom edge of the isolation region of the invention terminates at a level no lower than 100 nm below the top surface of the buried strap. This is clearly different than Mandelman, *et al.* wherein the collar oxide 28, 30 extends a distance past the top surface of the buried strap 37 that is even greater than the vertical length of the transistor. In fact, as shown in FIG. 5, the collar oxide extends all the way to the buried N plate 22.

Claim 10 has been amended for clarification purposes, but Applicant strongly disagrees that Mandelman, *et al.* could reasonably be interpreted to anticipate claim 10.

More specifically, in the rejection (page 4, line 4) the Examiner correctly identifies item 37 of Mandelman, *et al.* as the buried strap. However, three lines later in the rejection, the Examiner alleges that the buried strap comprises electrically conducting region 40, (a completely



different structure). This is simply incorrect. Region 40 is conductive, but it is the transistor gate, not the buried strap (see col. 5, lines 33-35). Further, conducting region 40 completely fills the trench. Region 40 is not formed proximate a first vertical edge and laterally displaced or spaced from an isolation collar region (28) formed on an opposing second vertical edge as required by the claims. Finally, the isolation collar region 28 does not terminate at an edge no lower than the top surface of the buried strap 37. The isolation region 28 of Mandelman, *et al.* extends almost to the bottom of the trench capacitor, and into the buried N plate region. The bottom edge of the region 28 is well below the top surface of the buried strap.

Therefore, it is respectfully submitted that independent claims 1 and 10 clearly are not anticipated by Mandelman, *et al.*

The remainder of the dependent claims were rejected under 35 U.S.C. 103(a) as being obvious over Mandelman, *et al.* alone or over Mandelman, *et al.* in view of Sommer, *et al.*

In the rejection, the Examiner appears to allege that extending the bottom edge of the isolation collar below the top surface of the buried strap by no more than about 50 to 100 nm was nothing more than an optimum working range. This simply is not the case.

As pointed out in the background of the application, theoretically, it is advantageous to extend the STI deeply into the substrate, such as for example, 200-400 nm below the buried strap. Unfortunately, as the feature size of the vertical DRAM decreases the resulting aspect ratio of the device increase, which makes manufacturing the device using known processes very difficult without also forming unacceptable voids and other defects. Such voids undermine or defeat the very purpose of the STI. Thus, prior art efforts have been directed to finding manufacturing processes that can fill STI areas without also forming voids.



The present invention on the other hand, recognizes that effects of a buried strap in a vertical DRAM can be laterally constrained in the absence of and adjacent STI, and that consequently the STI can be vertically confined such that it does not have to extend below the level of the buried strap. The advantage of these characteristics simply have not been recognized and without such recognition there is simply no reason or motivation to experiment or attempt to optimize in a manner adverse to the accepted best practices.

Referring to FIG. 5 of the Mandelman, *et al.* reference, it is clear that the inventors did not recognize these characteristics, as the STI oxide 28 is shown or extending substantially below the buried strap 37. Further, column 5, lines 26-28 of Mandelman, *et al.* states that "the collar oxide may extend about the entire deep trench." All of the figures of Mandelman, *et al.* illustrates an oxide collar (or isolation region) extending almost to full depth of the trench.

Therefore, it is respectfully submitted that the present claims do patentably define over all references of record and are allowable.



In view of the above, Applicant respectfully submits that the application is in condition for allowance and requests that the Examiner pass the case to issuance. If the Examiner should have any questions, Applicant requests that the Examiner contact Applicant's attorney at 972-732-1001 so that such issues may be resolved as expeditiously as possible. No fee is believed due in connection with this filing. However, should one be deemed due, the Commissioner is hereby authorized to charge the appropriate fees to Deposit Account No. 50-1065.

Respectfully submitted,

15 November 2005  
Date

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